GEOGRAPHIC SCHOOL BULLETINS

OF THE NATIONAL GEOGRAPHIC SOCIETY, WASHINGTON 6, D.C.

OCTOBER 25, 1954 VOL. XXXIII, NO. 4

Scottish Treasure Hunt Recalls Spanish Armada

Amoy Cargo Brewed Boston Tea Party

Two-Century-Old Columbia Grows with New York

How to Live with Snakes and Like It

Rivers of the World: The Amazon

Columbia's Paved Campus—Students join the seated Alma Mater statue in front of Low Memorial Library for a sun-bask between classes. They come from all over the world to study everything from mines to music at the University on New York City's Morningside Heights. Some will decipher Egyptian papyri preserved in the 3,000,000-volume Butler Library. Riverside Church rises in the background.

(SEE PAGE 41)

MANNY WARMAN

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on the green at Plymouth. Lord Howard, the commander, became nervous at the nearness of the Armada, but Sir Francis quieted him with, "There's plenty of time to win this game and thrash the Spaniards too."

At the appointed time the smaller English ships, which could sail circles around the top-heavy floating castles of the enemy, swarmed out of coastal ports and dealt the invaders one of the decisive defeats of all time. The great Armada was outsailed, outfought, broken up, harried and herded eastward past Dover and into the North Sea. Drake, Howard, Frobisher, Hawkins thus established England's mastery of the seas.

Rigging smashed and hulls leaking, the Spanish fleet tried desperately to get home by sailing around all Britain. Wild storms ended what the Elizabethan sea rovers had begun. Ships sank unrecorded. Others smashed on hostile coasts from the Shetlands to the west of Ireland. Fewer than half the ships and a third of the men returned to Spain.

***Florencia* Sinks at Tobermory**—*Florencia*, now on its own, sought shelter in Tobermory Bay on the island of Mull in the Inner Hebrides. While there it was sunk "by treacherie"—no one knows how.

There the ship's proud-sad story might have ended but for one persistent tradition: that aboard when it went down was the pay for the Armada's thousands of sailors and soldiers. Proving that history lives, the 11th Duke of Argyll today has divers dredging the muck of 366 years to get at the golden ducats of the payroll that was never met.

The Scottish duke has sole salvaging rights to the treasure, if any. His ancestor, 29 years after the Armada adventure, traveled to Spain where he met *Florencia's* captain, who had survived his ship's sinking. The Spaniard confirmed rumors of vast wealth aboard his ship. Argyll won a royal grant giving him and his heirs 99% of any recovered wealth. Whether or not divers find gold, the excavation of an Armada galleon offers treasure to historians. The work could yield invaluable historical data.

Spain in Scotland—Unlike *Florencia's* lucky captain, most Spaniards cast ashore during the savage storms were massacred—10,000, it is said, by Irish chiefs alone. Yet enough survived to leave an indelible mark of Spanish heritage in many a northern corner of the British Isles.

The crew of one galleon cast upon Fair Isle between the Orkneys and Shetlands taught the island women Spanish methods of dyeing and weaving cloth, tradition tells. Fair Isle woolens are still bright and Latin-looking.

Spanish guns have been recovered from a wreck at St. Catharine's Dub on the Aberdeenshire coast. Some say the spot was named for *St. Catharine*, an Armada ship. On the opposite coast of Scotland wrecked vessels of the great fleet are known through all the Hebrides. Off Connaught in northwest Ireland, 12 were lost and their crews killed.

References—Waters through which Armada ships fled after defeat by the British are shown on the National Geographic Society's map of The British Isles. Write the Society, Washington 6, D. C., for map price list. An etching of the battle is included in "Ships of the Centuries," *National Geographic Magazine*, Jan., 1938; information on the islands past which the ships sailed appears in "From Barra to Butt in the Hebrides," Oct., 1954; "Shetland and Orkney, Britain's Far North," Oct., 1953; "Over the Sea to Scotland's Skye," July, 1952; "Hunting Folk Songs in the Hebrides," Feb., 1947. *(School and library discount price for Magazine issues a year old or less, 50¢; 65¢ through 1946. Send for prices of earlier issues. A color print of the above picture is available through the Society's Color Sheet service. Send for order list.)*

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JOHN SEYMOUR LUCAS, R.A.

The Great Armada Admits Defeat—Sir Francis Drake (right), who lost not a single vessel in the 1588 battle, accepts the sword of Don Pedro de Valdés. The victory assured England's mastery of the sea and spurred her colonizing exploits.

Scottish Treasure Hunt Recalls Spanish Armada

No prouder ship ever unfurled an emblazoned sail before the Atlantic wind. With 130 other galleons and men-of-war, the *Florencia* bore haughtily down upon England in 1588—part of the "Invincible and Most Happy Armada" Spain was sending to conquer the upstart island nation.

Pennants confidently flew from topmasts. Soldiers jammed the high decks seeking the first glimpse of enemy land. Still rankling their captains, they knew, was the humiliation suffered a year ago when the English sea dog Drake boldly sailed into Cádiz harbor and destroyed ships and supplies intended for this very Armada. Revenge would be sweet.

Massive Retaliation—16th-century Style—The great ships deployed in a half moon seven miles from tip to tip and sailed east up the English Channel. No greater naval striking force had ever ridden the waves. Nothing blocked its victorious path. By night *Florencia's* 600 soldiers laughed at the imagined panic on shore as bonfire after giant bonfire blazed on hilltops from Lizard Point to Plymouth.

But the fires were part of sober, unfrightened England's game. So carefully was defense planned that Drake and other captains were bowling

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Two-Century-Old Columbia Grows with New York

October 31 climaxes Columbia University's bicentennial with the arrival of Queen Elizabeth, the Queen Mother, from England. Her royal antecedent, George II, granted its charter as King's College 200 years ago.

The first class of eight students met in Trinity Church schoolhouse. But life in a town of some 10,000 souls upset the first President. "Amidst all this buzz and confusion I know not what to do," he wrote.

In 1760 the college sought peace on wooded acres overlooking the Hudson at Park Place, now forested with skyscrapers. But the approaching Revolution fired patriot Alexander Hamilton and his classmates.

After John Jay (class of '64) negotiated peace with England, King's College became Columbia with De Witt Clinton first to enroll. Robert Livingston ('65) swore in George Washington as President of the United States in New York, then the nation's capital, a booming city of 33,000.

In 1857 the gypsy-hearted college moved its 154 students and 6 professors to Madison Avenue and 49th Street, skirting New York's 800,000 people. "The new location is a delightful one," commented William Cullen Bryant. "Potter's Field is within a stone's throw." En route the college acquired land now taken up by Rockefeller Center.

Feeling cramped, Columbia moved to Morningside Heights in 1897. Buildings multiplied, school after school was acquired as Columbia, now a university, grew to world prominence. But New York marched right past it. Morningside Heights, engulfed in a city of 8,000,000, is today an "oasis on the subway line."

Columbia College, numbering but 2,300 of the University's 25,000 students, turns out scrappy Lion football elevens. Victory brings forth hearty verses of "Who Owns New York?" "C-O-L-U-Mmm-B-I-A!"

Royalty Visits Columbia—Elizabeth, now Queen Mother, here shown in 1939 with King George VI and Nicholas Murray Butler (Columbia's President, 1902-45), returns October 31.

Amoy Cargo Brewed Boston Tea Party

The thunderous cannonade between Chinese Nationalists on Quemoy Island and communists on the mainland has awakened echoes of another conflict that raged long ago and far away. From the Amoy-Quemoy area, where China's "vestpocket war" recently broke out, came the tea that fanned the flames that flared into America's Revolutionary War.

The Boston Tea Party showed King George what American colonists thought of his taxes. Much as they liked tea, they dumped a three-ship cargo of it into Boston Harbor rather than pay the tax. To avoid identification they dressed like Indians, complete with tomahawks.

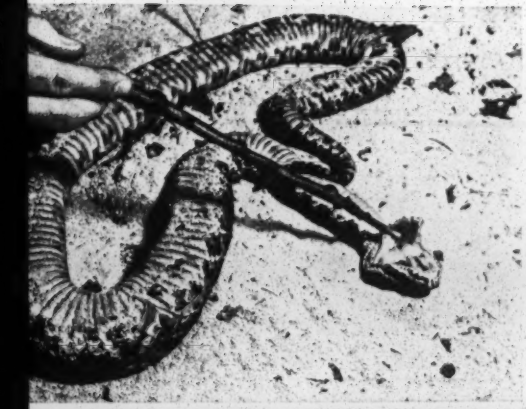
Along the China coast today square-sailed junks carry tea once brought to Europe by graceful vessels of the 18th century. Beating up from the south, their matting lug-sails rattle and snap in the wind. From Indonesia and other islands the lumbering vessels bring salt and rice—staples the battling Chinese no longer can entirely supply for themselves.

Back they go with China's silk, jade, tung oil, and tea—still grown despite the big-gun duel. Complete cargoes seldom reach either end of the line. Among the coastal islands, once strongholds of marauding pirates, modern freebooters in official guise demand tribute in the shape of a few pounds of salt, a piece of silk, a handful of jade. In return, they extend "protection." Old customs linger.

Amoy was the first Chinese port to trade with Europeans. In 1842 it was named one of five "treaty ports" opened to foreign trade and residence.

Amoy's next-door neighbor, Quemoy, has been a thorn in the communist side. When Nationalist forces withdrew to Formosa in 1949, they retained several coastal islands. Quemoy, largest and closest to the mainland, grew rice and wheat on sandy fields to support its 50,000 residents. Now 50-square-mile Quemoy is fortified and supplied from Chiang Kai-shek's Formosa stronghold, 80 miles east.

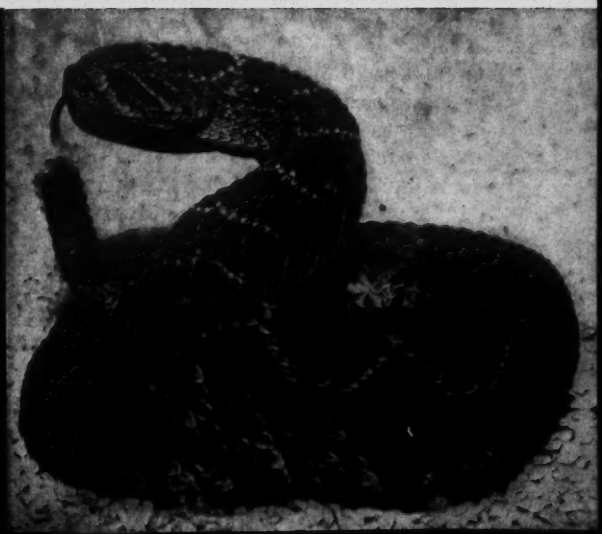
References—The Amoy-Quemoy area shows on the Society's map of The Far East. See "Eyes on the China Coast," *National Geographic Magazine*, April, 1953; "Trawling the China Seas," March, 1950; "Formosa—Hot Spot of the East" (original title, "Poor Little Rich Land—Formosa"), Feb., 1950; "Pirate-Fighters of the South China Sea," June, 1946; GEOGRAPHIC SCHOOL BULLETINS, March 2, 1953, "Formosa Again Becomes Front-Page News"; Oct. 9, 1950, "Formosa Stands Guard off China."



the count of persons who die annually of snake bite. In the United States, the western diamondback rattler (lower right) probably causes greatest damage. Its inch-long fangs can sink into a human arm and inject a teaspoonful of venom. Copperheads bite more people, but their venom is weaker.

For extensive information about America's snakes, see "Our Snake Friends and Foes," with 15 reproductions of paintings by National Geographic Staff Artist and Naturalist Walter A. Weber, in the September, 1954, issue of *The National Geographic Magazine*.

LOWER LEFT: ROBERT E. LUNT



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DON LEVY

How to Live with Snakes and Like It

Most children have the usual human reaction to snakes—mixed feelings of fascination and fright. This California girl overcomes some of her prejudices as she handles a garter snake and learns that its skin is as dry as her own.

Reptiles and people can get along together if certain do's and don't's are observed. Some of them are illustrated at the left and below by Sam Dunton of the New York Zoological Society.

First, when you lift a rock or piece of wood, *don't* insert the fingers under the object and *do* stand behind it. In walking through the woods, pause with both feet on a fallen log and look before you step. On highways or wherever you find a dead snake, handle it with a stick. Even dead snakes can give a nasty bite through reflex action.

Finally, if you must probe into hollows, don't use your hand. A copperhead may be lurking below (lower left).

Many snakes are harmless, even helpful, ridding the farmer's corncrib of field mice and his barn of rats. But enough of them are poisonous to bring to 40,000 the count of persons who die annually of snake bite. In the United States, the

© JEAN MANZON

And truly it *is* a freshwater sea, flooding fifty miles across in places, draining parts of six countries—Bolivia, Peru, Ecuador, Colombia, Venezuela, and Brazil in a basin approaching the United States in size. Even in "dry" season the Amazon pours the waters of eight Mississippis into the Atlantic, staining the blue ocean over 150 miles from shore. Unlike the Mississippi the Amazon knows no levee, dam, lock, dredge, or bridge.

Rises near Pacific—Born of high Andean snows less than 100 miles from the Pacific, the Amazon writhes and plunges through many miles of deep Peruvian gorges before calming itself on its vast plain. Meandering through a maze of shifting channels toward the sea, it gathers to itself an estimated one fifth of the world's river waters from some 500 tributaries. About 3,900 miles from its Peruvian source it opens its jaws 170 miles wide to swallow Marajó, an alluvial island the size of Switzerland where cattle roam flooded ranges and cowboys lasso caymans.

Steamships enter by the southern channel, for north of Marajó sandbanks choke the passage. There the dread *pororoca*, the moon's monthly tidal wave, roars in from the sea at 45 miles per hour, sweeping away all in the path of its 10-to-15-foot walls of water.

Even Mark Twain's river pilots could pick up pointers from their Amazon counterparts, who dispense with charts in piloting wood-burning *gaiolas*—"bird cages," as the open-sided river boats are called—over the 30,000-mile network of navigable but ever-changing waterways. At Óbidos, which feels the daily ebb and flow of tides though 567 miles from the ocean, the Amazon shrinks to a single mile-wide channel 250 feet deep. Steamers reach Iquitos, Peru, 2,300 miles inland.

Too mighty for a single name, the mainstream is called Marañon ("*Mar*

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The Amazon: Highroad to Adventure

"A skull beneath every crosstie." Such is the story of the Madeira-Mamoré railroad, moldering in the heart of South America. The world's costliest 226 miles of track, this jungle line was built to skirt "the Devil's Staircase," 19 boiling rapids on the Amazon's Madeira arm.

In 1871 axes began to ring against hardwood. Engineers and surveyors inched their way through tangled *selva* toward Bolivia's forest riches. Blinded by swarms of insects, stung by two-inch-long tucandera ants, they worked hip deep in the mud-and-water home of alligators, electric eels, man-eating piranhas, and 30-foot anacondas. Hunger and disease stalked. Axe-blows grew weak, men dropped in their tracks.

The British contractors admitted defeat. In 1878 a Philadelphia firm made a second try and laid four miles of track before bankruptcy.

Horseless Carriage Brings Rubber Boom—Then came frenzied years of the rubber boom. World markets demanded fine hevea for tires. Bolivia in 1903 traded territory for Brazil's promise to finish the railroad. Workers were lured from many lands by "Garden of Eden" jobs at double wages. Thousands poured into the death trap. Few returned.

At last lessons learned in building the Panama Canal were applied. Sanitation engineers fought malaria, yellow fever, dysentery, and typhoid to a standstill. In 1912—40 years after the project's start—the first train load of rubber chugged out of Bolivia's Department of Beni.

By then the rubber boom was stretched to bursting. The Amazon's stampede for easy wealth had seen 40-cent-a-pound hevea skyrocket to a dizzy three dollars. Some say the California and Klondike gold rushes were lawn fetes compared with Amazonia's Nero-like orgy in the first decade of this century. In mushrooming cities sudden millionaires built mansions of Carrara marble. Wives ordered gowns from Paris. Versailles chandeliers graced a land of howler monkeys and boa constrictors.

The rubber capital, Manaus, built the world's costliest opera house where the Rio Negro pours its glossy black waters into the chocolate Amazon a thousand miles inland. Steamers seeking cargoes of "black gold" berthed at floating docks that could rise and fall as much as sixty feet.

In Belém, commercial metropolis at the Amazon's mouth, rubber merchants lit fat cigars with hundred-milreis notes. At Santarém, where Southerners settled after America's War Between the States, men sent their dress shirts to Lisbon to be laundered.

Rubber Bubble Bursts—Then the sky fell in. In 1912 plantation rubber from southeastern Asia invaded the market till then monopolized by Brazil. Amazon rubber prices plummeted. Weeds overgrew the Manaus streetcar tracks. The Madeira-Mamoré railroad cut back to one train a week shortly after its completion. The unhurried, liana-choked Amazon again became the pulse of valley life.

During the November-to-June flood stage, people in stilt villages, in hut clusters on rises, in houseboats, confined like castaways with their dogs, pigs, and chickens, look out over *O Rio Mar*—The River Sea.

"canal" into the Orinoco. Lt. Herndon of the U. S. Navy made the first hydrographic survey of the Amazon in 1850. Theodore Roosevelt took the question out of the River of Doubt, which now bears his name.

But the Amazon jungle outbattled scrappy Henry Ford. Tree fungus decimated his Connecticut-size rubber holdings along the Tapajós River at Fordlândia and downstream at Belterra. Ford's high wages only too quickly paid the worker's bills. "So why, *senhor*, should I work some more?" shrugged the caboclo. In 1946, after 19 years of struggle, Ford sold his $15,000,000 investment to the Brazilian government for $250,000.

Amazonia still suffers after-effects of the 1900-12 debauch when rubber barons raided Indian villages for slaves and brought drought-stricken farmers from the bulge of Brazil to work rubber trails under the whips and .44 rifles of overseers. Debt-slavery, the stultifying system of land tenure, disease, malnutrition, lack of transportation—these problems remain. Considered by many the world's hope for feeding the fast-

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C.I.A.A.

A Rubber Ball Is Born—After hevea trees are tapped, the *caboclo* pours sap over a revolving stick above a smoke pot and repeats the process until a large ball forms.

o non?"—Sea or not? asked early Spaniards) in its upper reaches, Solimões from the Peru border to Rio Negro, and Amazonas (after the long-haired warriors the first explorers fought) from there to the sea.

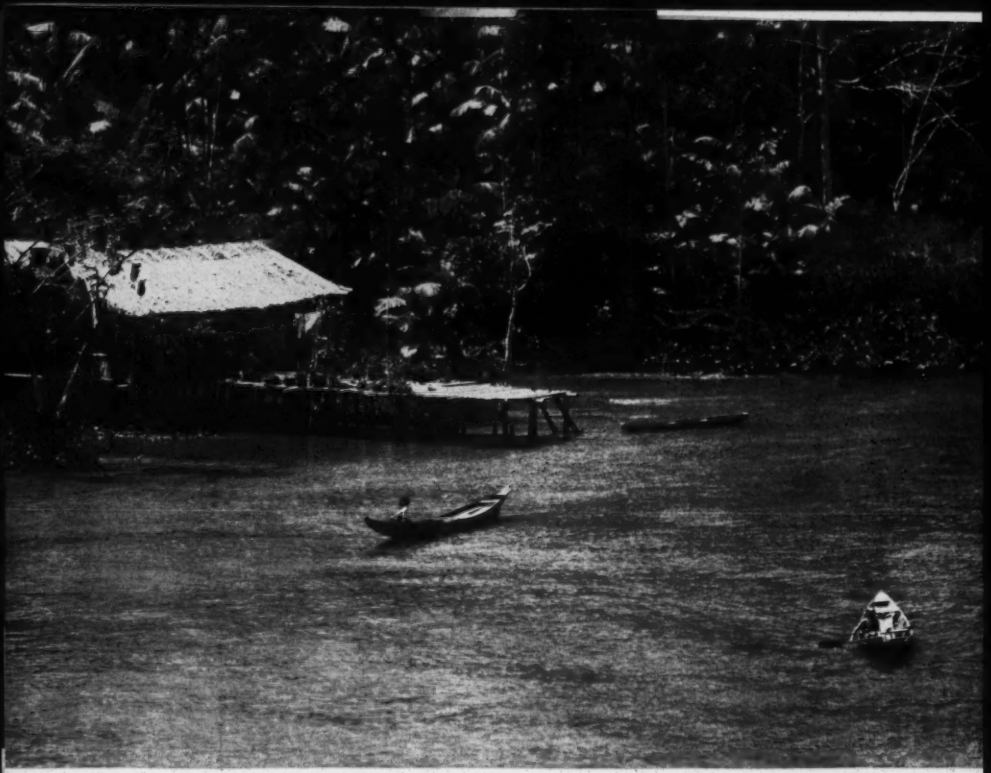
When flood waters recede, bank dwellers emerge from hammocks and palm-thatched huts. They plant fresh-silted bottom lands or slash and burn new garden plots out of dense jungle matting the *tierra firma,* or higher land. The *caboclo,* the Amazon Brazilian of Portuguese-Indian blood, grows beans, corn, and rice, but mostly manioc, a starchy root which his wife makes into *farinha* or flour.

The caboclo makes payments on his standing debt with the trading post by collecting Brazil nuts, cutting firewood for steamers, and tapping rubber trees. He may carry a shotgun in case an agouti, a paca, a forest fowl, or a wild pig should cross his path. He crushes the poison from timbo vines, spreads it in backwater pools to stupify fish. He harpoons the giant *pirarucu* (up to 300 pounds) whose flesh he strips, dries, salts, and sells as "Brazilian codfish."

El Dorado or Green Hell—Despite the caboclo's lot, men still see the Amazon as a place to strike it rich. Francisco de Orellana started it when his pioneering descent of the Amazon in 1541 fired Europe's imagination. Others have made the Amazon a highroad to adventure. Early friars penetrated a wilderness said to be peopled by giants, dwarfs, and by the Guayazis whose feet face backward and cause persons following the footprints to walk the wrong way. Later, English missionaries raised funds by selling to museums the poisoned darts shot at them by hostile Indians!

Naturalists came to marvel at the cathedral vaulting of the towering rain forest. They saw the vegetation's frenzied climbing fight for life-giving sun, the incredible variety and size of species, and strange creatures which "seemed to have been put together with spare parts of other animals." Louis Agassiz collected 1,800 distinct species of fish; others counted 700 butterfly species, 8,000 trees. Of the world's 22,767 known species of plant life classified by the botanist von Martius, 19,619 are Brazilian.

Explorers probed tributaries in dugouts so tricky "you have to go ashore to sneeze." They paddled up Rio Negro, through the Casiquiare



ALBERT W. STEVENS

The Wall-Like Amazonian *Selva* Forces Indians to Live in Stilt Homes at Water's Edge

multiplying global population, Amazonia imports much of the food consumed by its 1,500,000 inhabitants, one to every two square miles.

But progress is being made. Brazilian public-health services, backed by strong initial American aid, have stamped out malaria and dysentery in many parts of the valley. Agricultural research at Belterra is developing new food and market resources, new techniques of insect control, of stock raising. Manganese, iron, bauxite, and oil are being prospected.

By-passing the railroad age, Amazonia's airlines link far-flung towns and cities. Peru has built a 500-mile highway over the Andes, joining Lima with Pucallpa on the Ucayali River. Yet much cargo still goes 6,000 miles by ship from eastern Peru to Callao via the Panama Canal.

Most promising of all is Brazil's overland march toward Amazonia from the southeast. New towns and airstrips on the plateau point a dagger at the heart of the basin; a new national capital, Brasilia, has been blueprinted to rise at its edge. Vast cattle ranges beckon. Rich agricultural lands, mines, one quarter of the world's forests await development. The riches are there, to be realized by patient toil and government sponsorship—not by dreams of easy wealth, not by the whistle of the lash.

References—The Amazon River is shown on the Society's map of South America. See "Jungle Jaunt on Amazon Headwaters," *National Geographic Magazine*, Sept., 1952; "Sea Fever," Feb., 1949; "Wonder Island of the Amazon Delta," Nov., 1938; "Journey by Jungle Rivers to the Home of the Cock-of-the-Rock," Nov., 1933*; "Amazon, Father of Waters" and "Exploring the Valley of the Amazon in a Hydroplane," April, 1926* (*out of print; refer to your library); GEOGRAPHIC SCHOOL BULLETINS, Oct. 6, 1953, "Jungle Frontier Holds Wealth for Brazil."